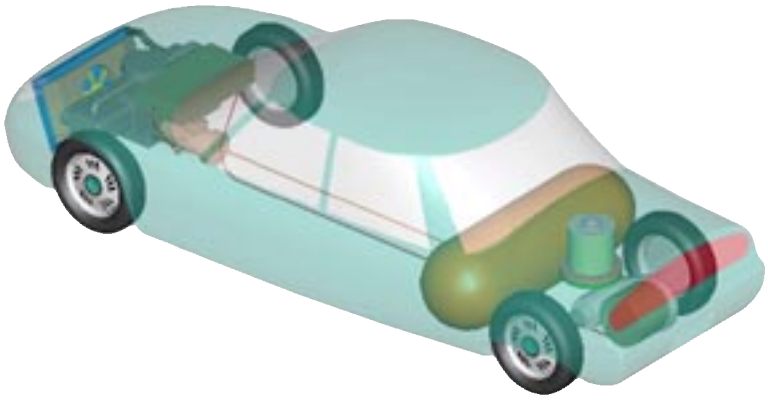
Hydrogen Hybrid-Electric Automobile

A high-mileage, low-pollution alternative to gasoline-powered vehicles

A concept is evolving at LLNL for a highly efficient hybrid-electric automobile that gets the equivalent of 80 mpg, has a 380 mile range without refueling, and produces significantly less pollutants than a gasoline-powered vehicle. The envisioned automobile is a hybrid-electric that combines a hydrogen-fueled piston engine with an electric generator. The hydrogen fuel, stored as either a cryogenic liquid, a high pressure cryogenic gas, or in the form of a metal hydride, supplies chemical energy that is converted into electricity in the engine-generator set. An advanced flywheel or an ultracapacitor is used to store electrical energy. The power capacity of the flywheel or ultracapcitor is enough to accelerate the vehicle at a brisk 0 to 60 mph in less than l0 seconds. The technology used in the hybrid-electric vehicle is well understood and can be available in the near future. The cost of the engine-generator combination is estimated to be less than $l00/kW ($75/hp).



A conceptual design of a hydrogen hybrid vehicle features a large fuel tank for pressurized hydrogen. It has a gasoline-equivalent fuel economy of 80 mpg and a range of 380 miles.

ADVANTAGES

- *High mileage (estimated at 80 mpg equivalent)*
- *Significantly less emissions than a gasoline-powered vehicle*

The engine for the vehicle operates at a constant speed and power at its maximum efficiency point, without ever idling. The engine is started when it is necessary to charge the flywheel or ultracapacitor and it is turned off when the charging process is complete. The engine takes advantage of the very special properties of hydrogen to operate very lean at a very high compression ratio, which results in a very high engine efficiency and very low emissions. Even without a catalyst, the engine produces less nitrous oxides, hydrocarbons, and carbon monoxide than those produced by a gas-fired power plant generating the amount of electricity needed to charge the battery of an electric car.

Availability: LLNL and Sandia national laboratories/California are jointly developing the optimized, hydrogen-fueled piston engine and the storage systems with funding from tile DOE Office of Utility Technology Hydrogen Program. LLNL is developing the advanced flywheels, with funding from a Cooperative Research and Development Agreement, as a part of the DOE Office of Transportation Technology Hybrid Vehicle Program. These system components are currently under development for commercial application.

Contact:

J. Ray Smith
Phone: (510) 422-7802
Fax: (510) 423-0618
E-mail: jrsmith@llnl.gov
Mail code: L-641